ISSN 2816-8070

RESEARCH ARTICLE

Unpacking the Effects of Revised FDI Policy on India's Life Insurance: Through the Lens of Profits/(Loss) and Equity

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Abstract

The Indian government has focused on attracting Foreign Direct Investment (FDI) to the insurance sector to drive innovation, increase competition, and improve access to insurance products. The FDI policy has undergone several changes to achieve these goals. The literature assessing the impacts of FDI policy and changes in it pertaining to the insurance sector has remained scarce in terms of the empirical investigations. The current study explores the statistical significance of the changes in FDI limit for insurance sector, from 26 percent to 49 percent that have been implemented in the beginning of the past decade. The scope of the study is limited to the life insurers only. For the purpose, it employs Granger causality test, Hausman test and difference in difference model. There are six model specifications of which three different specifications regress profits/loss after tax and another three different ones regress Indian equity investment on the suitable regressors. Different statistical information criteria support the choice of the best fit model and further these chosen models are checked for the validity and robustness with the help of plots of standardized residuals, tests for Heteroskedasticity-robust standard errors, Placebo test, Wald test and Sargan test. The results suggest that those life insurers which have received additional foreign direct investment due to the increase in the FDI limit from 26 to 49 percent have been benefitted differently in terms of profit earning capacity as well as attracting the Indian promoters. Such life insurers attracted more Indian promoters as well as earned hike in their profit after tax which is statistically confirmed by the positive nature of the relationship of response variables with the DID coefficient.

Key Words: *FDI; Insurance; Treatment; Policy; Equity; Hausman test*

JEL classification: *F39, G22, C21*

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***Received Date**: March 19, 2025, **Accepted Date**: June 13, 2025, **Published Date**: June 26, 2025*

***Citation:** Rawat RS. Unpacking the Effects of Revised FDI Policy on India's Life Insurance: Through the Lens of Profits/(Loss) and Equity. Int J Bank Fin Ins Tech. 2025;3(1):107-126.*

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1. Introduction

The Indian insurance sector has experienced significant growth and transformation in recent years. This sector plays a vital role in the country's financial system, providing protection, savings, and investment options to individuals and businesses alike. Additionally, the sector mobilizes the domestic savings and channelize these funds into productive investments that contribute to the country's economic development. This helps in increasing the overall capital available for infrastructure projects and other growth-oriented initiatives. The sector has been growing rapidly with the diverse offerings of products to the nation. The sector has a regulatory framework too. The brief prologue to the sector may include:

1.1. Rapid growth

India's insurance industry has experienced significant growth in recent years, driven by increasing consumer awareness and government initiatives to expand coverage. Especially, Indian life insurance industry has witnessed an annual growth of around 13 percent in FY 2022-23. Both private and public life insurers played hard and grew by 16.3 and 10.9 percent in the same FY.

1.2. Diverse offerings

The sector offers a wide range of products, including life, health, motor, and property insurance, catering to the diverse needs of the Indian population.

1.3. Regulatory landscape

The insurance industry in India is regulated by the Insurance Regulatory and Development Authority of India (IRDAI), ensuring consumer protection and market stability.

1.4. Emerging opportunities

With increasing digitization and growing middle-class, the insurance sector in India is poised for further growth, particularly in the areas of e-commerce and rural insurance.

There are few additional characteristics of the Indian insurance sector which may include promoting the financial inclusion; enhancing socio economic stability via risk mitigation, retirement security and health care access; fostering economic growth; embracing digitization etc. In terms of developing a strong infrastructure within the sector, it requires significant capital investment due to its high capital intensity. The Indian government has focused on attracting Foreign Direct Investment (FDI) to the insurance sector to drive innovation, increase competition, and improve access to insurance products. The FDI policy has undergone several changes to achieve these goals. The key changes in the FDI policy include:

Increase in FDI limit: From 26 percent (in August 2000) to first hike up to 49 percent (in February 2015) and second hike up to 74 percent (in May 2021) were the increases made in the FDI limit for Indian insurance companies.

Simplified approval process: Prior to August 2017, the foreign investment up to 26 percent was allowed under the automatic route of entry to the insurance sector in India but beyond 26 percent and up to 49 percent of foreign investment was allowed under the Government approval route. In August 2017, the entire foreign investment entering the sector and up to 49

percent was allowed under an automatic route . In October 2020, all the insurance intermediaries were allowed under automatic route for foreign investment.

The Government focused on FDI scheme/policy and the above-mentioned changes in it for the insurance sector are believed to have few important impacts, which include:

- **Increased inflow of funds:** The inflow of funds has been increased. Recently, a news article appeared in The Economic Times, stating that insurance sector attracted ₹54,000 crore FDI in last nine years as told by Financial Services Secretary of India.
- **Improved product innovation:** The influx of foreign expertise and capital has driven the development of new and innovative insurance products according to the needs of the Indian market.
- **Enhanced competition:** The increased foreign participation has intensified competition in the insurance sector, leading to better pricing, improved customer service, and a wider range of product offerings.
- **Impact on product offerings:** The range of products in life insurance, health insurance, general insurance companies, and pension and retirement schemes has expanded.
- **Increased insurance penetration and density:** The FDI policy changes have contributed to the growth of the insurance sector, leading to increased insurance penetration (is measured as the percentage of insurance premiums to GDP), and awareness among the Indian population which is revealed in the insurance density (is calculated as the ratio of premium to population (per capita premium)). As per the Handbook on Indian Insurance Statistics (2022-23), published by IRDAI, the penetration rose to 4.2 percent in 2021-22 from 3.9 percent in 2013-14. Then in 2022-23 it declined marginally to 4 percent. On the other hand, the insurance density grew at a remarkable pace during the past decade and stood at 92 USD per capita in 2022-23 (52 USD per capita in 2013-14).
- **Technological advancements:** The influx of foreign expertise and capital has driven the adoption of innovative technologies, such as digital platforms and data analytics, to enhance customer experiences and operational efficiency.
- **Increase in employment:** The foreign investment has also created the requirements for additional workforce due to the rise in the number of clients as well as strengthened operations.

These above beliefs in terms of positive impact of FDI scheme/policy and its changes in the Indian insurance sector have remained empirically underexplored, lacking statistical substantiation to ascertain their validity. Moreover, the existing literature in the area is scarce and provides descriptive insights only. The present study has an objective of assessing empirically whether the change in the limit of FDI from 26 percent to 49 percent (implemented in February 2015) made a significant difference to the life insurance companies in terms of profit/loss after tax and outstanding values of equity investment made by Indian promoters. Please note that from here onwards, in the subsequent portion of the paper, the outstanding values of equity investment made by the Indian promoters will be simply termed as Indian equity.

The data are sourced from Insurance Regulatory and Development Authority of India (IRDAI). Data consists of the entity wise information on profit/loss after tax (in ₹crore), total premium (includes first year as well as renewal premium) (in ₹crore), and Indian equity (in ₹crore) during the period (FY 2008-09 to FY 2021-22). To assess the impact of the above-mentioned change, six different model specifications are considered. For the purpose, author employed the Granger's causality test, Hausman test and Difference – in – Difference (DID) model. Additionally, the nature of the estimated coefficients (if significant) is also analyzed

and interpreted. Further, the results obtained have been validated using the plots of standardized residuals against the predicted values, and by employing various other statistical tests for ensuring the robustness. These include tests for Heteroskedasticity-robust standard errors, Placebo test, Wald test and Sargan test. This study supports that the above-mentioned change in the FDI limit caused a significant and additional difference to those life insurers which have received additional foreign direct investment. Such life insurers attracted more Indian promoters as well as earned hike in their profit after tax which is statistically confirmed by the positive nature of the significant relationship of response variables (PAT and Indian equity) with the DID coefficient.

This paper further proceeds to the relevant literature review in Literature Review, the stylized facts about the life insurance sector (excluding other entities than life insurers) are exhibited in Stylized Facts about Life Insurance in India, the data with its source and employed methods are explained in data source and employed methods, the results obtained are discussed and validated in discussions on results followed by the conclusions and future course of actions in conclusion.

2. Literature Review

The existing pioneer literature on the impact of changes in FDI policy for Indian life insurance sector, has remained underexplored statistically yet few qualitative studies have been reviewed, in which descriptive statistics or some basic statistical tests are utilized.

Hasan [1] theoretically focused on providing the detailed introduction to the Indian insurance sector and emphasized on the opportunities arising from the expansion of Foreign Direct Investment (FDI) within the sector, as well as addressed its significant challenges. The present study is dealing with life insurance sector (excluding other entities than life insurers) and assessing an impact (if any) on its profit/loss after tax and Indian equity due to the change in the FDI limit from 26 percent to 49 percent.

Hebbar, et al. [2] brought forward a descriptive study assessing the impact of introduction of FDI in insurance sector, which was based on the secondary data from IRDAI. Their study was conducted for the select four private life insurers in the life insurance sector and the variables under study were FDI contribution and the number of life insurance advisors. They had employed ratio analysis for assessing the impact and for determining the cause-and-effect relationship between two variables. The present study is like their investigation in terms of data sourcing. However, it is different in terms of the primary objective of assessing an impact of change in FDI limit from 26 percent to 49 percent, the coverage of life insurance companies, variable under investigation and statistical methods used. The present paper is focusing on the entire life insurance sector, different variables are being investigated viz. profit/loss after tax and Indian equity, and econometric tests as well as models are employed other than ratio analysis.

Gattaiah [3] attempted to examine the implications and outcomes of Foreign Direct Investment (FDI) and assess the performance of both public and private insurance companies in India using the Student's t test. The study sought to analyze whether a significant change exists in the growth of total insurance premiums due to the introduction of FDI in the insurance sector, between public and private insurance companies (considering both life and non-life) using t-test. The current study is again alike due to the investigation of impact of the change in FDI limit on different variables.

Nithya, et al. [4] explored to determine the advantages of lifting the restrictions on overseas direct funding by the Indian insurance region, to investigate the extent of government support for insurance zones in India and to identify challenges associated with foreign direct investment in the insurance industry. Shameem also conducted the similar study and assessed the implications of FDI on Indian insurance sector [5].

Thapar, et al. [6] aimed to examine the decision made by the Government of India (GOI) to raise the Foreign Direct Investment (FDI) limit in the insurance sector from 49 percent to 74 percent in FY 2021-22. It had focused on the objective of understanding the implications of this change in FDI and how it influenced customers' choices. But the study is entirely a qualitative one in the absence of sufficient data for conducting the quantitative study. The present study is similar to their study as it is also investigating whether there exists any impact of changing the FDI limit from 26 percent to 49 percent but alike in terms of the approach, variables under consideration and statistical methods which are making quantitative analysis.

3. Stylized Facts about Life Insurance in India

Before discussing upon the employed econometric tests and models, and discussing about their empirical results, it is important to have a glance at few important stylized facts pertaining to the Indian life insurance sector (excluding other entities than life insurers). These facts are presented for the longer time horizon (FY 2001-02 to FY 2021-22) than that taken for the empirical study (FY 2008-09 to FY 2021-22).

3.1. Life insurance penetration and density

The life insurance penetration started declining from FY 2010-11 (4.4 percent) onwards and during FY 2014-15 to FY 2019-20 it was more or less saturated. But during pandemic (FY 2020-21) it rose to 3.2 percent as compared to 2.8 percent in FY 2019-20 (Figure 1) and in FY 2021-22 also, the same level of 3.2 percent was maintained. On the other hand, the life insurance density rose during the past decade from 41 USD per capita (FY 2013-14) to 69 USD per capita (FY 2021-22) and it has been experiencing a rising trend from FY 2014-15 onwards.

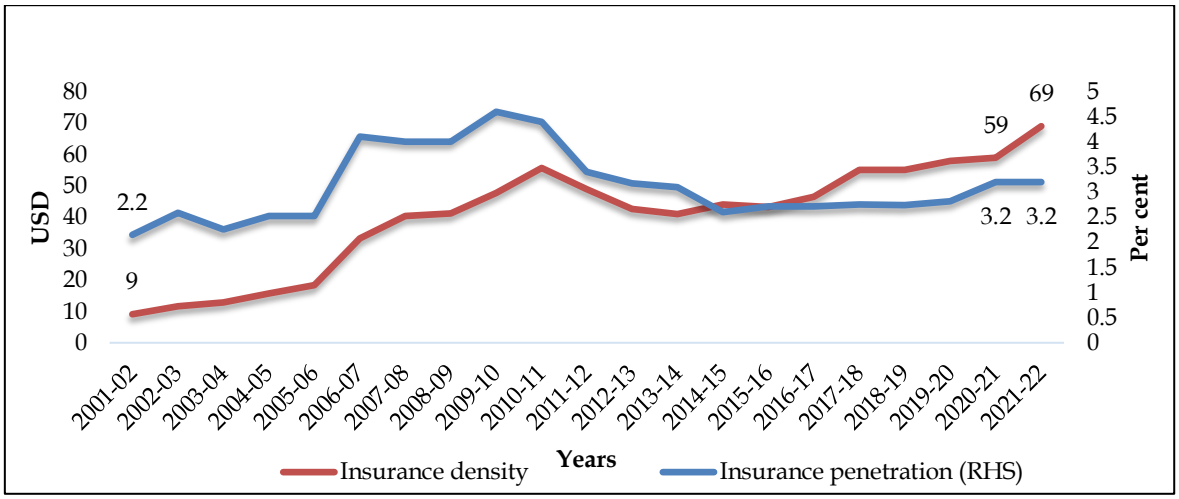

Figure 1: *Life insurance penetration and density.*

Source: *IRDAI, handbook of Indian insurance statistics.*

3.2. Market share of the leading player (LIC)

The market share of the leading player i.e. LIC of India has reduced to 60.7 percent during the past two decades (from 99.5 percent in FY 2001-02). This implies that the private players have been penetrating their roots in this sector (excluding other entities than life insurers) continually (Figure 2).

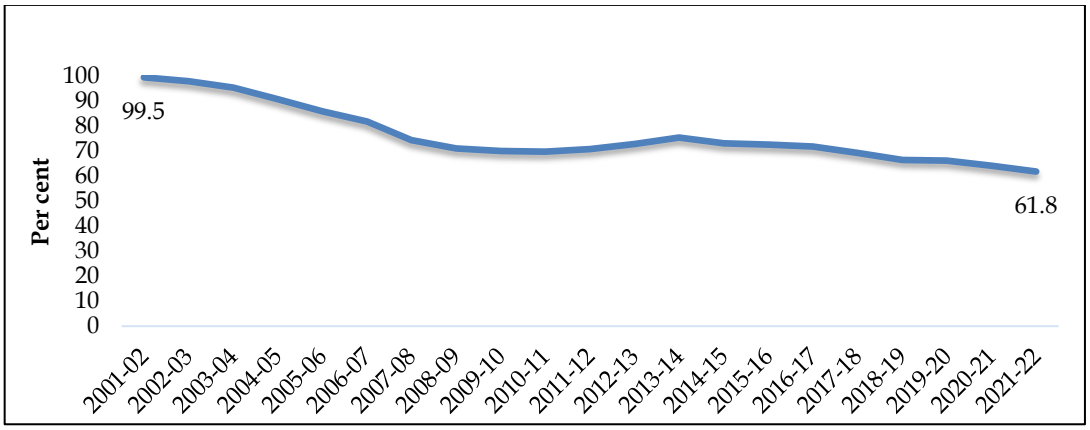

Figure 2: *Market share of LIC-based on total premium.*

Source: *IRDAI, handbook of Indian insurance statistics.*

3.3. Total premium income and profit/(loss) after tax (PAT)

The total premium income has shown a consistent upward trajectory over the last twenty years, with a notable acceleration (steeper slope) observed since FY 2014-15 onwards (Chart 3) and the total premium income of the sector (excluding other entities than life insurers) has been doubled in FY 2021-22 (₹6,92,614 crores) as compared to FY 2014-15 (₹3,28,102 crores). On the other hand, the profit/(loss) after tax (PAT) in the life insurance sector (excluding other entities than life insurers) grew merely by 1.8 percent in FY 2021-22 (₹7,751 crores) as compared to FY 2014-15 (₹7,611 crores). It remained relatively stable over the preceding decade.

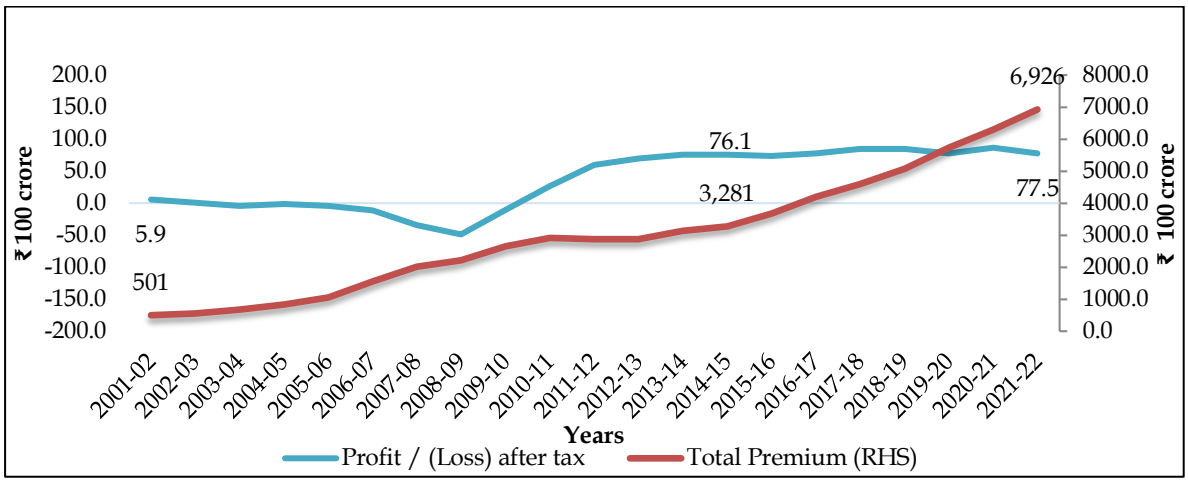

Figure 3: *Total premium income and PAT.*

Source: *IRDAI, handbook of Indian insurance statistics.*

3.4. Total equity shares capital and its comparison with PAT

A noticeable bump was observed in the outstanding values of total equity share capital (including foreign as well as Indian promoters) of life insurance (excluding other entities than life insurers) from FY 2006-07 through FY 2020-21, including the pandemic period. Subsequently, there was a significant surge, reaching ₹35,547 crores in FY 2021-22 (Chart 4) and the annual growth in FY 2021-22 remained robust, standing at 25.4 percent for outstanding position of equity share capital. However, PAT also followed the same bump yet in FY 2021-22 its annual growth contracted at (-) 10.5 percent.

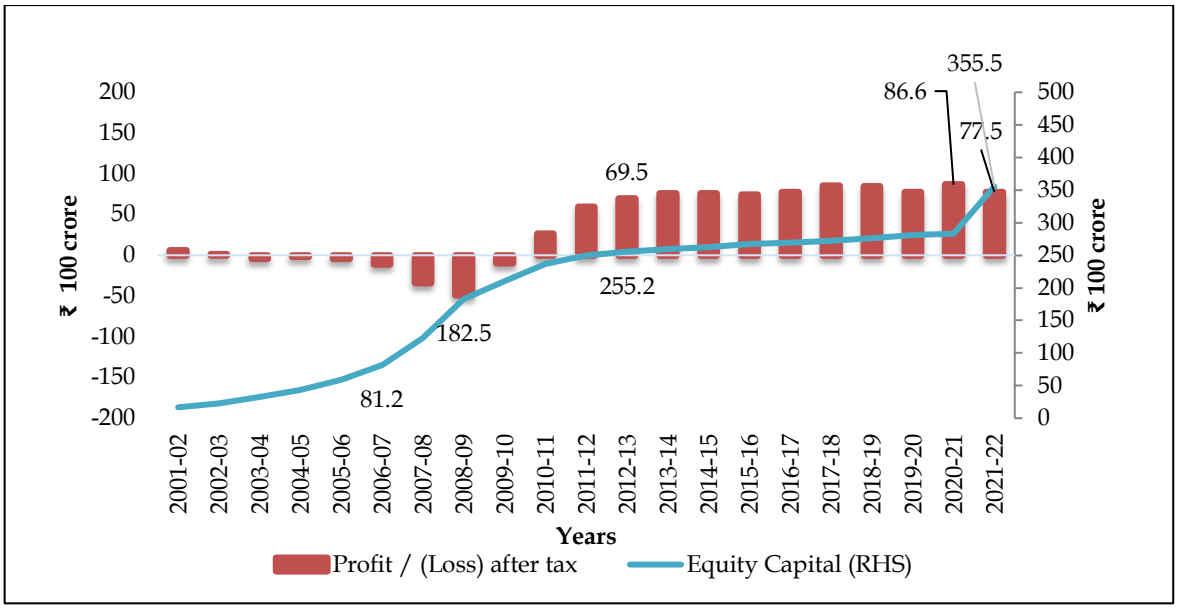

Figure 4: *Total equity shares capital and PAT.*

Source: *IRDAI, handbook of Indian insurance statistics.*

4. Data Source and Employed Methods

The entity wise data for twenty-four life insurers is sourced from the Handbook of Indian Insurance Statistics (editions for FY 2012-13 and FY 2022-23). The variables under study are profit/(loss) after tax (PAT) and Indian equity in an entity. The Indian equity is an outstanding position as on March 31, of every year for an entity. Both the above stated variables (PAT, and Indian equity) are treated as dependent variables in this study. It is important to further mention that lagged value of Indian equity has been treated as controlling variable for the PAT. There is one more variable under study, which is treated as a controlling variable, viz. the total premium income of each entity (life insurer). The study period ranges from FY 2008-09 to FY 2021-22. The brief research design is given below which will be elaborated subsequently.

As shown in Figure 4 regarding the brief research design is given below which will be elaborated subsequently.

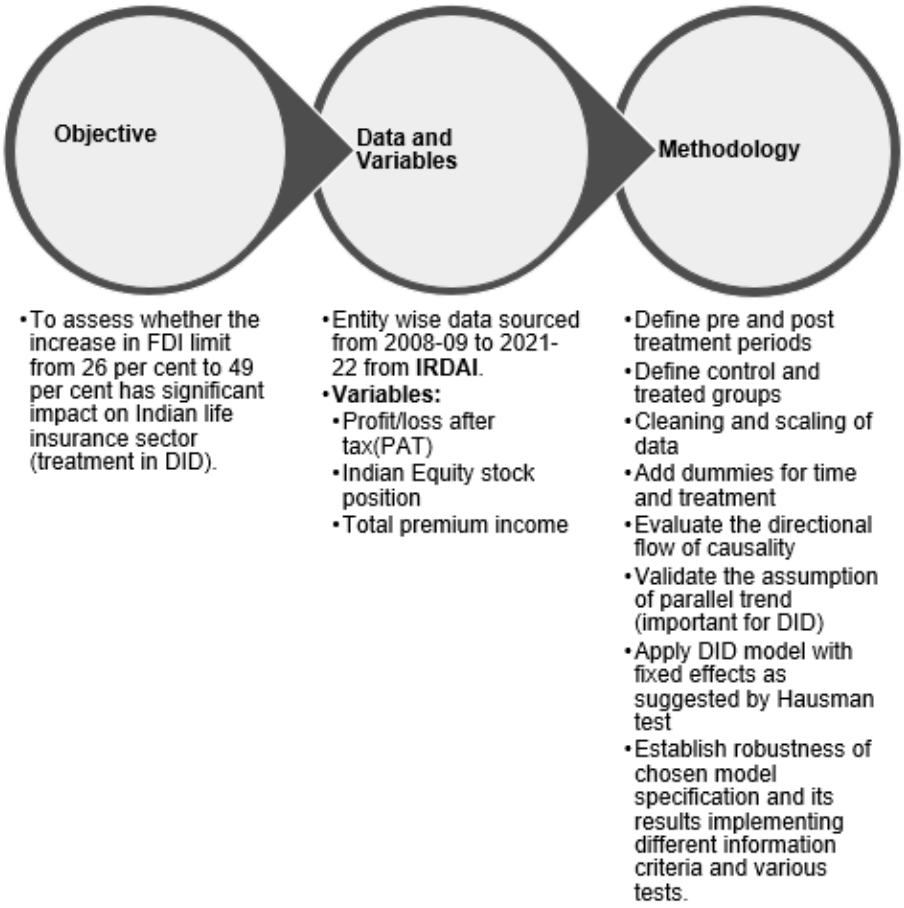
Objective
Data and Variables
Methodology
•To assess whether the increase in FDI limit from 26 per cent to 49 per cent has significant impact on Indian life insurance sector (treatment in DID).
•Entity wise data sourced from 2008-09 to 2021-22 from IRDAI.
•Variables:
•Profit/loss after tax(PAT)
•Indian Equity stock position
•Total premium income
•Define pre and post treatment periods
•Define control and treated groups
•Cleaning and scaling of data
•Add dummies for time and treatment
•Evaluate the directional flow of causality
•Validate the assumption of parallel trend (important for DID)
•Apply DID model with fixed effects as suggested by Hausman test
•Establish robustness of chosen model specification and its results implementing different information criteria and various tests.

Figure 4: *The study period ranges from FY 2008-09 to FY 2021-22. The brief research design is given below which will be elaborated subsequently.*

There exist two companies namely Edelweiss Tokio and IDBI Federal (presently Aegas Federal) that had not started their operations since FY 2008-09 onwards. Additionally, there are few entities which got demerged, so their names (identities) got changed. As a matter of fact, these entities were in joint ventures with other enterprises, however, in none of the cases, the business portfolios were merged. The joint venture was only for capital infusion purpose. For instance, Aegon Religare Life Insurance Company Limited has now become Aegon Life Insurance Company Limited only, when the joint venture capitalist (Religare Enterprises Ltd.) quit the venture. There are other similar instances identified where portfolios remain unchanged whereas their identity with reference to names got changed. The data consist of the information on all the variables for all the companies as per their existence, which means for the entities that got started later than FY 2008-09, the earliest available published figure have been used and for those entities which have got merged during the study period, the mapping of identities is done to obtain all the data points.

For the convergence purpose of the applied models, the data units in ₹crores have been scaled to ₹100 crores. The change in FDI limit from 26 percent to 49 percent in FY 2014-15 is considered as a treatment applied to life insurers during that financial year. The time of applying for the treatment is FY 2014-15. The data points from FY 2008-09 till FY 2014-15 are considered as pre-treatment observations and those available from FY 2015-16 onwards are considered as post-treatment observations. Further, out of the twenty-four entities, two entities have never received the treatment viz. LIC of India and Sahara India Life Insurance Co. Ltd, that is these two entities have not received FDI till date. These two entities

undoubtedly become the members of the control group. Additionally, Exide life insurance company received FDI up to 26 percent during the period FY 2008-09 to 2011-12, thereafter, it did not receive FDI rather disinvestments happened in the company and the FDI percent reached to zero after FY 2012-13 onwards. Hence, this also becomes the member of the control group. Limiting the control group to just these three entities doesn't hinder the comparison between it and the treatment group because LIC of India is a giant player in the life insurance sector, holding a market share exceeding 60 percent in FY 2021-22.

A comparison is also made in Table 1(a) before analyzing the control and treatment groups for the main objectives of the study. This comparison consists of the shares of control and treatment groups in total PAT, Indian equity and premium income for the FY 2021-22 (latest year in the study period). It is demonstrating that despite having only three members in the control group, both the groups remain comparable.

Table 1(a): *Comparison of control and treatment groups for compositions.*

	Control	Treatment	Total
PAT	4,036	3714	7,750
	-52.1	-47.9	-100
Indian Equity	8407	16153	24,560
	-34.2	-65.8	-100
Premium Income	4,31,854	2,60,760	6,92,614
	-62.4	-37.6	-100
figures in parenthesis represent % share in total.			

The dummy variables for time, treatment and their interaction are also introduced in the data. The dummy variables time and treatment are indicator variables taking value 0 in case of pre-treatment observation and 1 in case of post-treatment observation, and 1 for the j^(th)entity if it belongs to the treatment group and 0 for the control group member respectively. This study first evaluated the directional flow of causality among the variables using the Granger's Causality test.

Post assessment of causality flow, the assumption regarding the parallel trend for both the dependent variables is ensured by plotting the graphs during pre-treatment period. When the plot seems to be unclear regarding the fulfillment of this assumption, the study applies a linear model to the data during the pre-treatment period and assesses whether the interaction term is insignificant during that period (an ideal situation for the parallel trend to hold). Then after, the Difference-in-Difference (DID) model is fitted with fixed effects as suggested by the Hausman test with the given below six model specifications (Table 1(b)).

Where, i = {0,1,2}, j = {1,2,3,…..,24}, t = {1,2,3,…,14}, β's are the estimated coefficients in the model, X_{1jt} is a total premium income at time t for the j^{th} entity, $X_{1j(t-i)}$ is a lagged value of total premium income with lag i at time t for the j^{th} entity, similarly, $X_{2j(t-i)}$ is a lagged value of Indian equity with lag i at time t for the j^{th} entity, $Time_t$ is an indicator variable taking value 1 if t takes value beyond 2014-15 and 0 otherwise, $Treatment_j$ is an indicator variable taking value 1 for the j^{th} entity if it belongs to the treatment group and 0 for those belonging to the control group, $Interaction_{jt}$ is the interaction term between the former two indicator (dummy) variables for the j^{th} entity and time t, δ_j is a fixed effect for the j^{th} entity and finally, ε_{jt} is an error term which is assumed to be white noise process.

Table 1(b): *Model specifications.*

Model number	Dependent variable	Specifications
Model_1	PAT	$PAT_{jt} = \beta_0 + \beta_1 Time_t + \beta_2 Treatment_j + \beta_3 Interaction_{jt} + \delta_j + \varepsilon_{jt}$
Model_2		$PAT_{jt} = \beta_0 + \beta_1 X_{1jt} + \beta_2 Time_t + \beta_3 Treatment_j + \beta_4 Interaction_{jt} + \delta_j + \varepsilon_{jt}$
Model_3		$PAT_{jt} = \beta_0 + \beta_1 X_{1jt} + \beta_2 X_{2j(t-1)} + \beta_3 Time_t + \beta_4 Treatment_j + \beta_5 Interaction_{jt} + \delta_j + \varepsilon_{jt}$
Model_4	Indian equity	$Indian\ equity_{jt} = \beta_0 + \beta_1 Time_t + \beta_2 Treatment_j + \beta_3 Interaction_{jt} + \delta_j + \varepsilon_{jt}$
Model_5		$Indian\ equity_{jt} = \beta_0 + \beta_1 X_{1j(t-2)} + \beta_2 Time_t + \beta_3 Treatment_j + \beta_4 Interaction_{jt} + \delta_j + \varepsilon_{jt}$
Model_6		$Indian\ equity_{jt} = \beta_0 + \beta_1 X_{1j(t-2)} + \beta_2 X_{1j(t-1)} + \beta_3 Time_t + \beta_4 Treatment_j + \beta_5 Interaction_{jt} + \delta_j + \varepsilon_{jt}$

After fitting these six above model specifications to the data, their results are compared with each other for assessing the good as well as a valid fit for each dependent variable. The comparison was based upon the adjusted R^2 values, Akaike Information Criterion (AIC) and Bayesian Information Criterion (BIC) values and by employing the plot of standardized residuals against the predicted values of the dependent variable. Additionally, a few robustness tests are also carried out which include tests for Heteroskedasticity-robust standard errors, Placebo test, Wald test and Sargan test.

5. Discussions and Results

5.1. Results of granger causality test

Granger causality test is applied to PAT, Indian equity and premium income with lags of order two and one, with the hypotheses:

Only in two cases (case 4 and 5), the results given above in the table show the significance at one percent level of significance. In case 4, it may be inferred that adding lagged values of total premium income (@ lag of order upto 2) granger causes the Indian equity and significantly improves the model's ability to predict the same.

H_0: The variable (X_t) does not Granger cause the dependent variable (Y_t).
H_1: The variable (X_t) Granger causes the dependent variable (Y_t).
Where pair (X_t, Y_t) is different (any two of the PAT, Indian equity and premium income) in different cases. The obtained results are exhibited below in Table 2.

Table 2: *Summary results of the granger causality test.*

Model	df	F statistics	$\Pr(F_{cal} > F)\ p-value$
Cases with lag of order two			
Case 1: if Indian equity granger causes PAT	343	1.18	0.0587
Case 2: if total premium income granger causes PAT		0.19	0.1131
Case 3: if PAT granger causes Indian equity		1.34	0.2624
Case 4: if total premium income granger causes Indian equity		9.69	0.0001***
Cases with lag of order one			
Case 5: if Indian equity granger causes PAT	345	40.76	0.0000***
Case 6: if total premium income granger causes PAT		2.42	0.1207
Case 7: if PAT granger causes Indian equity		0.42	0.517
Case 8: if total premium income granger causes Indian equity		0.59	0.4401
*** denotes significance at level 0.01			

Source: *Author's calculations.*

This is indicated by the significant F-statistic (9.69) and the very low p-value (0.0001), suggesting that the inclusion of lagged value of total premium income is statistically significant in explaining the variations in Indian equity. Similarly, in case 5, the results indicate that including lagged values of Indian equity (@ lag of order upto to 1) significantly improves the model's ability to predict PAT which is evident from the significant F-statistic (40.76) and the very low p-value (0.0005), indicating that the inclusion of lagged value of Indian equity is statistically significant in explaining the variations in PAT.

The total premium income at either of the two lags, does not granger cause the PAT although it is expected as well as obvious that current income remains a major component which can cause profit/loss. So, we calculated the Pearsonian correlation between PAT and the total premium without any lag and found the correlation value of 75.81 percent. Therefore, in model specifications 2 and 3 above in Table 1 (Model_2 and Model_3) the total premium income (without any lag) is added as an independent/controlling variable.

5.2. Findings of hausman test

Now, the study steps forward towards the discussion of the results obtained by applying the Hausman test to the above mentioned six model specifications, which enables the authors to choose statistically between the fixed and random effects model. Table 3 given below shows the results of the Hausman test in case of each model specification. The hypotheses under the test remain, H_0: The random effects model is appropriate (i.e. the individual effects are uncorrelated with the explanatory variables). H_1: The fixed effects model is appropriate (i.e. individual effects are correlated with the explanatory variables).

The summary results in Table 3 above show that there exists sufficient evidence to reject the null hypothesis (H_0) for all the model specifications, at one percent level of significance. This means that the fixed effects model is the suitable one for all these six model specifications while panel regression is applied under DID model.

Table 3: *Summary results of Hausman test.*

Model Specification	Test Statistic (Chi square)	*df*	*p - value*	Remark
Model_1 (PAT regressed on Dummies)	11.61	3	0.0089***	Hausman test suggests that fixed effects model is suitable for all the model specifications.
Model_2 (PAT regressed on premium and dummies)	10.71	4	0.0313***	
Model_3 (PAT regressed on Indian equity @ lag 1, premium and dummies)	16.67	5	0.0052***	
Model_4 (Indian equity regressed on Dummies)	9.14	3	0.0274***	
Model_5 (Indian equity regressed upon premium @ lag 2 and Dummies)	16.71	4	0.0022***	
Model_6 (Indian equity regressed upon premium @ lags 2 and 1, and Dummies)	98.99	5	0.0000***	
***denotes significance at level 0.01.				

Source: *Author's calculations.*

5.3. Verification of parallel trend assumption

Before proceeding to fit the DID model, it's also essential to verify whether the critical assumption of parallel trends between the control and treatment groups during the pre-treatment period holds true or not. For the purpose, the plots of average PAT and Indian equity for each time point during the period 2008-09 till 2014-15 have been plotted for both the treatment and the control groups (Figures 5 and 6).

In case of PAT, the parallel trend assumption graphically seems hard to be satisfied whereas for Indian equity it seems to be satisfied from the beginning only. To further validate the parallel trend (in case of PAT) on a concrete basis, a panel linear regression is employed in which PAT is regressed upon the interaction term. The data during pre-treatment period, for both control and treatment group is used. The results are shown below in Table 4.

Table 4: *Summary results of panel regression.*

Explanatory variables	Estimate	Standard Error	*t* statistic	*p - value*
Interaction	0.29	0.35	0.83	0.4025
Total Sum of squares	Residual Sum of squares	R^2 value	Adjusted R^2 value	F statistic (p - value) with *df*
1434.9	832.73	0.42	0.31	47.72 (0.0000***) with *df* 2 and 132
***denotes significance at level 0.01.				

Source: *Author's calculations.*

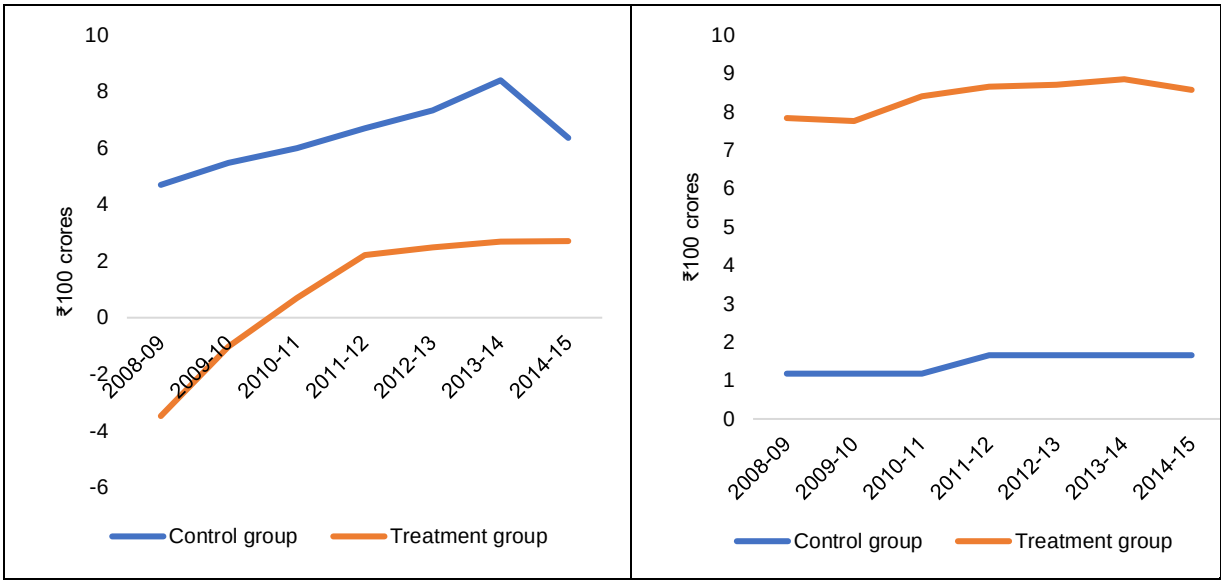

Figure 5 & 6: *The plots of average PAT and Indian equity for each time point during the period 2008-09 till 2014-15 have been plotted for both the treatment and the control groups.*

Source: *IRDAI, handbook of Indian insurance statistics and author's calculations.*

The estimate of interaction term (in Table 4 above) during the pre-treatment period is insignificant with the p-value of 0.4025 which is as required for a parallel trend assumption to hold. This implies that there exists a parallel trend between the PAT of control and treatment groups.

5.4. Fitting of Difference-in-Difference (DID) model and results

Thereafter, the DID model is fitted using the Driscoll-Kraay standard errors to avoid the issues that may arise due to the serial correlation and cross-sectional dependence and the following results are generated (Table 5 and 6).

In the below Table 5, it is observed that when PAT is regressed under the first three different model specifications, the lowest AIC and BIC values (1658.56 and 1762.57 respectively), and the highest adjusted R^2 (36 percent) exist for the third model specification under which PAT is regressed upon Indian equity (@ lag of order 1), total premium income and dummy variables (time, treatment and their interaction).

The DID model is significant also at one percent level of significance which is indicated by the p-value less than 0.01. So, based on these facts, it may be considered as the best model among the first three model specifications which regress PAT on different explanatory variables.

Based on the AIC, BIC and adjusted R^2 values, and analyzing the results for the rest of the three model specifications under which the Indian equity is regressed, it is found that Model_5 (where Indian equity regressed upon premium @ lag 2 and Dummies) is better than Model_4 (where Indian equity regressed on Dummies) as the AIC and BIC values are lower in the case of Model_5 (AIC: 1858.80, BIC: 958.96) when compared with Model_4 (AIC: 1938.99, BIC: 2035.29). Also, the explained variation by the regressors, in terms of the adjusted R^2 is higher for Model_5.

Table 5: *Assessment of overall model fit.*

Model Number	R^2	Adjusted R^2	F statistic	$\Pr(F_{cal} > F)$ or $p-value$	AIC	BIC
Model_1 (PAT regressed on Dummies)	0.15	0.08	6.19	0.0023***	1784.19	1880.94
Model_2 (PAT regressed on premium and dummies)	0.39	0.34	7.26	0.0001***	1669.19	1769.34
Model_3 (PAT regressed on Indian equity @ lag 1, premium and dummies)	0.41	0.36	56.84	0.0000***	1658.56	1762.57
Model_4 (Indian equity regressed on Dummies)	0.05	0.06	6.75	0.0002***	1938.99	2035.29
Model_5 (Indian equity regressed upon premium @ lag 2 and Dummies)	0.23	0.17	5.82	0.0007***	1858.8	1958.96
Model_6 (Indian equity regressed upon premium @ lags 2 and 1, and Dummies)	0.24	0.18	4.8	0.0009***	1855.56	1959.57

*** denotes significance at level 0.01.

Source: *Author's calculations.*

However, if Model_5 is further compared with the Model_6, then both the criterion values have not been lowered and there is also not much increase in the explained variation too (in terms of adjusted R^2). Therefore, it may be stated that the additional variable is not adding significant value to the model and its analysis. Hence, Model_5 is chosen as the best fit ultimately among the last three model specifications.

But further these two chosen model specifications (Model_3 and Model_5) for both the dependent variables (PAT and Indian equity respectively) are analyzed regarding the significance of the individual component in these models. Not only significance but also the estimates of these individual components along with their standard errors are shown, analyzed and interpreted. These results are presented below in Table 6.

Table 6: *Estimated coefficients and their significance.*

Model Number	Variable	Estimated Coefficients	Standard Error	p - *value*	$\Pr(F_{cal} > F)$ or $p - value$
Model_3 (PAT regressed on Indian equity @ lag 1, premium and dummies)	Intercept	-0.02	0.01	-2.09	0.0376**
	Indian equity @ lag 1	0.23	0.07	3.44	0.0007***
	Premium income	0.01	0.0004@	18.76	0.0000***
	Time	-0.09	0.04	-2.27	0.0235**
	Treatment	0.1	0.02	5.49	0.0000***
	Interaction	0.05	0.02	2.5	0.0128**
Model_5 (Indian equity regressed upon premium @ lag 2 and Dummies)	Intercept	0.07	0.004@	15.95	0.0000***
	Premium income @ Lag 2	0.01	0.0014@	9.25	0.0000***
	Time	-0.04	0.01	-3.32	0.001***
	Treatment	0.2	0.09	2.28	0.023**
	Interaction	0.03	0.01	2.17	0.0312**

*** denotes significance at level 0.01 and ** denotes significance at level 0.05. @ denotes nearest to zero only.

Source: *Author's calculations.*

On comparing the results given in Table 6 above, it is observed that in Model_3, the estimates of the coefficients of Indian equity @ lag of order 1, premium income and treatment effect (23, 1 and 10 percent respectively) are significant at one percent level of significance with p-values 0.0007 and 0.0000 respectively. However, the estimated coefficients for time effect (9 percent), and interaction effect (DID coefficient) (5 percent) are significant at five percent level of significance with p-values 0.0230 and 0.0128 respectively. It is also important to note that all the four significant variables (two controlling variables, treatment effect and DID coefficient) are having direct/positive impact on PAT whereas time is inversely impacting the profits which is as per the expectation. Further, the estimated coefficient of Indian equity (invested in previous year) may be interpreted as, a change of ₹100 crores in the Indian equity this year may likely to increase the PAT for the next year by ₹23 crores keeping the other variables being constant. Similarly, the estimated coefficient of premium income may be interpreted as the change of ₹100 crores in the premium income during the current year may likely to increase the PAT by ₹1 crore keeping the other variables being constant.

The baseline difference between the PAT earned by the treated and control group entities is estimated as 10 percent (coefficient of treatment) during pre-treatment period. Now the main objective underlying the study is to find out whether the change in the FDI limit from 26 percent to 49 percent in FY 2014-15 is making any additional significant impact (difference) on the life insurers' PAT or not. If so, then how much is the extent of this additional impact? The first question is already answered above in affirmative in terms of the significance of the DID coefficient at five percent level of significance. The significant DID coefficient implies that the said change in the FDI limit has brought some important impact for the life insurers' PAT.

The second question is also answered from the above results where the estimated value of the DID coefficient is shown as 5 percent. This suggests that the PAT has increased significantly and additionally by 5 percent for those life insurers which have received FDI up to 49 percent after FY 2014-15. In other words, 5 percent is the estimated causal effect due to the change in the FDI limit. Additionally, it may also be interesting to observe that the estimated expected/mean PAT for the control group is (-) ₹2 crores/₹100 crores during the pre-treatment period and the same is improved to ₹7 crores/₹100 crores during post treatment period. Similarly, the estimated mean PAT for the treatment group during pre-treatment period is observed as (-) ₹12 crores/₹100 crores and ₹2 crores/₹100 crores during post treatment period. Hence, the improvement in the estimated coefficients for treated and control groups during the post treatment period (i.e. 2015-16 onwards) is ₹14 and ₹9 crores/₹100 crores respectively (Annex, Table A).

Similarly, in case of Model_5, it is observed that premium income (@ lag of order 2) (i.e. premium income earned two years ago) influences the Indian equity for the current year by 1 percent and it is significant at one percent level of significance. The relationship between these two variables is of direct nature which is as per the expectation. The remaining dummy variables are also found significant. Time is also inversely related to the Indian equity like the case of PAT under Model_3. Since the DID coefficient (3 percent) is significant in this model also, at five percent level of significance, therefore, it may be inferred that Indian equity has also significantly improved by additional 3 percent after the change in the FDI limit for those life insurers which have exhausted the limit of 49 percent in terms of receiving the FDI investment.

Additionally, in this case also, it may seem interesting to note that the estimated average of Indian equity (investment by Indian promoter) for the control group during pre-treatment period is observed as ₹7 crores/₹100 crores and during post treatment period it is improved to ₹11 crores/₹100 crores. The average Indian equity for the treatment group is estimated at (-)₹13 crores/₹100 crores (implying disinvestment by the Indian promoters) during the pre-treatment period which is improved to (-)₹6 crores/₹100 crores during post treatment period. Hence, the improvements in the estimated coefficients for the treated and control groups during the post treatment period are found to be ₹7 crores and ₹4 crores/₹100 crores respectively (Annex, Table B).

5.5. Validation of best fit model specifications

The validity of these two model specifications is carried out using the plots of standardized residuals against the predicted values of the dependent variables, which are provided in Annex (Figure 1 and 2). Both the figure show that the standardized residuals are randomly distributed under both the model specifications. Hence, it may be inferred that both the models are the best as well as valid fits too. Further the robustness of these two models is checked using different techniques as mentioned above in Section IV of this paper. One important test out of those is a placebo test which assesses for the presence of true causal effect using the applied two best fit models. The two best fit models are again fitted to the data filtered corresponding to the pre-treatment period and the results affirmatively confirm that there is no spurious effect of treatment which is seen in the obtained results. The additional difference between the control and treatment groups (apart from the parallel trend) is truly due to the implementation of the treatment (i.e. the change in the FDI limit in our case) but not due to the existence of any other confounded effect. The summary results are provided below in Table 7.

Table 7: *Summary result of placebo test.*

Model_3 (PAT regressed on Indian equity @ lag 1, premium and dummies)						
Variables	**Estimate**	**Standard Error**	***t - value***	***p - value***	**R^2**	**Adj. R^2**
Treated (False effect)	0.42	1.76	0.24	0.8096	0.26	0.12
Interaction effect (False effect)	1.95	1.82	1.07	0.2871		
Model_5 (Indian equity regressed upon premium @ lag 2 and Dummies)						
Treated (False effect)	0.04	1.04	0.04	0.9655	0.15	0.13
Interaction effect (False effect)	1.19	1.05	1.12	0.2635		
*** denotes significance at level 0.01.						

Source: *Author's calculations.*

The coefficients of interest are treatment effect and interaction effect (DID coefficient) in the placebo test. The test is conducted on the observations of pre-treatment period and a random point of time is assumed for a false introduction of treatment. Practically for a testing purpose, the middle point of this period (i.e. FY 2011-12) is chosen in this study for the false introduction of the treatment. Then it is tested whether DID coefficient and treatment effect are found significant or not. For a DID model to be valid, it is important and ideal that these coefficients are observed insignificant during pre-treatment period. Then further, this implies that there is no other confounded effect present which may create a difference between the treatment and control groups. Analyzing the results above in Table 7, it is apparent that the estimated coefficients of both the effects under both the models are insignificant with very high p – values. This provides evidence to state that the two DID models can capture truly the additional difference caused by the change in FDI limit from 26 to 49 percent and those insurers which have received the additional foreign investment have been benefitted significantly.

The summary of the other tests (Heteroskedasticity-robust standard errors, Wald and Sargan tests) is provided in the Annex (Table 3) and indicates that both the model specifications are robust.

6. Conclusion

In FY 2014-15, the FDI limit in the Indian insurance sector (including insurance company, insurance brokers, third party administrators, surveyors and loss assessors, and other insurance intermediaries under the provisions of IRDA act 1999) was increased from 26 percent to 49 percent. However, the impact of this change remained underexplored empirically. The existing literature is scarce in the field of insurance which deals with the empirical significance of impact of the above-mentioned change in the FDI limit. The present study pertains to the life insurers only and explores the said impact for its statistical significance by employing DID model under six different model specifications. The results so obtained indicate that there are two model specifications which are the best and the valid fits. Under one model specification, PAT is regressed upon the lagged values of Indian equity (lag of order one) that is the previous year values of it, the current year values of total premium income and the dummy variables for time, treatment and their interaction (DID coefficient). Under the other one, Indian equity is regressed upon the lagged values of total premium income (lag of order two) of insurers that is the premium income earned two years ago and the same set of dummy variables. The model specifications suggested that those life insurers

which have received additional foreign direct investment due to the increase in the FDI limit from 26 to 49 percent have been benefitted differently in terms of profit earning capacity as well as attracting the Indian promoters. Such life insurers attracted more Indian promoters as well as earned hike in their profit after tax which is statistically confirmed by the positive nature of the relationship of response variables (PAT and Indian equity) with the DID coefficient. Further, the controlling variables under each model of these two models are also found significant in explaining the variations in the PAT and Indian equity. A direct relationship is observed between response variables and their respective controlling variables.

- **Future course of actions:** The study may be extended to the entire set of insurers including both life as well as non-life insurers i.e. for the entire insurance sector in India. Another major extension could be to investigate the additional impact of hike in the FDI limit from 49 percent to 74 percent in 2021 and from 74 percent to 100 percent in 2025, once the sufficient data is available for leading analysis and interpretations.

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Annexure

Table A: *Additional information (Model_3).*

Time	Treated group	Control group
0 (Prior to 2015-16)	((-0.0236)-(0.1)=) -0.1236 ~ -0.12	-0.0236 ~ -0.02
1 (2015-16 onwards)	((-0.0236)-0.1-(-0.09)+0.05=) 0.0164 ~ 0.02	((-0.0236)-(-0.09)=) 0.0664 ~ 0.07
Vertical Difference	(0.02-(-0.12)=) 0.14	(0.07-(-0.02)=) 0.09
Diff-in-Diff (DID)	(0.14 - 0.9 =) 0.05	

Source: *Author's calculation. Please note that these results have been obtained using the summary results of Model_3 in Table 6.*

Table 2: *Additional information (Model_5).*

Time	Treated group	Control group
0 (Prior to 2015-16)	(0.07-0.2=) -0.13	0.07
1 (2015-16 onwards)	(0.07-(-0.04)-0.2+0.03=) -0.06	(0.07-(-0.04)=) 0.11
Vertical Difference	((-0.06)-(-0.13)=) 0.07	(0.11-0.07=) 0.04
Diff-in-Diff (DID)	(0.07-0.04=) 0.03	

Source: *Author's calculation. Please note that these results have been obtained using the summary results of Model_5 in Table 6.*

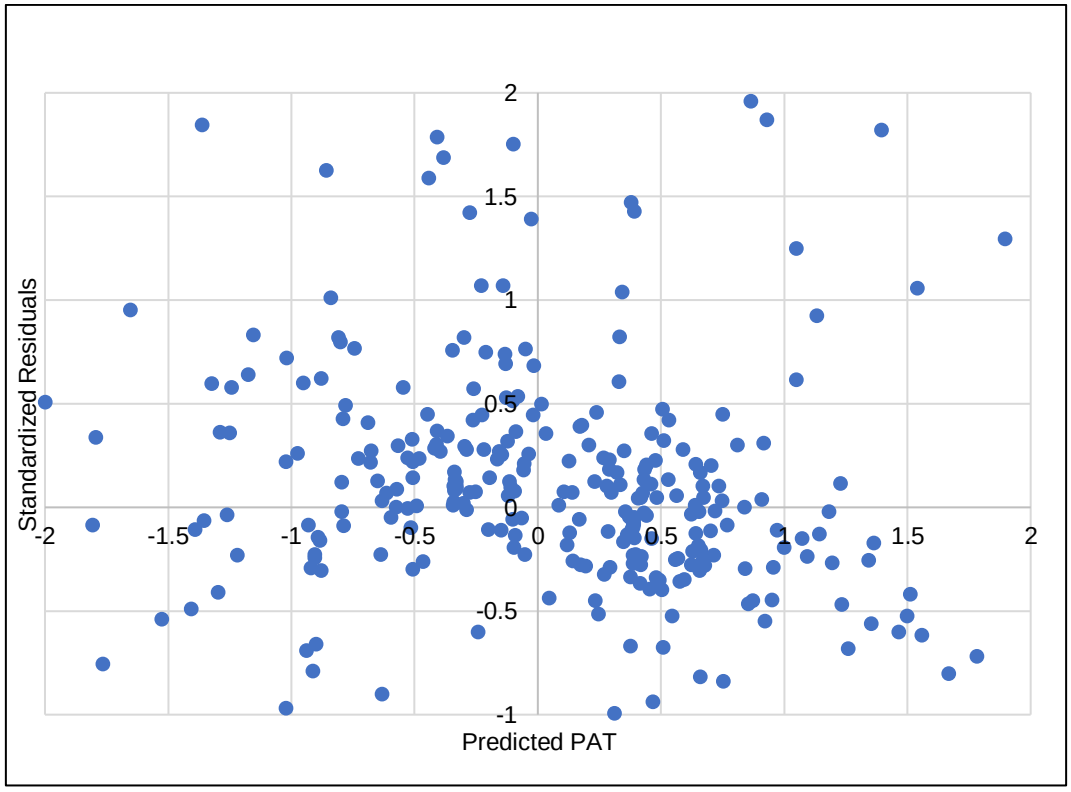

Figure 1: *Standardized residuals v/s predicted PAT.*

Source: *Author's calculations.*

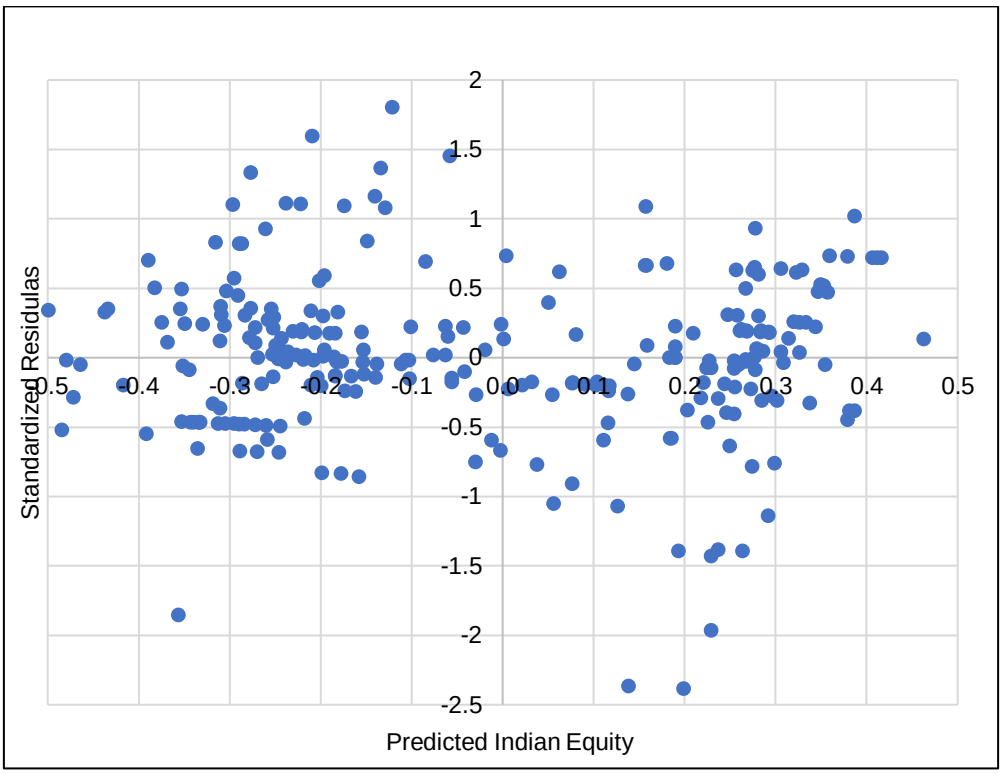

Figure 2: *Standardized residuals v/s predicted Indian equity.*

Source: *Author's calculations.*

Table 3: *Summary of tests for robustness checks.*

Model_3				
Test for Heteroskedasticity-Robust Standard Error				
Variable name	**Estimate**	**Standard error**	***t* value**	***p* - value**
Indian equity @ lag or order 1	0.26	0.07	3.6	0.0004***
Premium income	0.01	0.0014@	7.56	0.0000***
Wald and Sargan tests				
Test name			**x^2 Test statistic value**	***p* - value**
Wald Test			475.99	0.0000***
Sargan Test			8.44	1
Model_5				
Test for Heteroskedascticity-Robust Standard Error				
Variable name	**Estimate**	**Standard error**	***t* value**	***p* - value**
Premium income (@lag of order 2)	0.01	0.0011@	10.62	0.0000***
Wald test				
x^2 Test statistic value		***p* - value**		
279.23		0.0035***		
*** denotes the significance at 0.01 level and @ denotes that standard errors are too small.				

Source: *Author's calculations.*